

### Welcome!

We greatly appreciate your purchase of the MT104-102 6-In 1-Out VGA Switcher Card. We are sure you will find it reliable and simple to use. Superior performance for the right price, backed by solid technical and customer support is what ALTINEX has to offer.

We are committed to providing our customers with Signal Management Solutions® to the most demanding audiovisual installations at very competitive pricing and we welcome you to join the ranks of our many satisfied customers throughout the world.

### 1. Precautions and Safety Warnings

Please read this manual carefully before using your MT104-102. Keep this manual handy for future reference. These safety instructions are to ensure the long life of your MT104-102 and to prevent fire and shock hazard. Please read them carefully and heed all warnings.

#### 1.1 General

- Qualified ALTINEX service personnel or their authorized representatives must perform all service.

#### 1.2 Installation Precautions

- To prevent fire or shock, do not expose this unit to water or moisture. Do not place the MT104-102 in direct sunlight, near heaters, or heat-radiating appliances, or near any liquid. Exposure to direct sunlight, smoke, or steam can harm internal components.
- The MT104-102 contains components that are sensitive to electrostatic discharge (ESD). Always use ESD safety precautions when touching the card.
- Handle the MT104-102 carefully. Dropping or jarring can cause damage.
- Insert the card carefully into the slots of the MultiTasker without bending any edges.
- When removing a card, please make sure that the expansion card to which it is attached is also pulled out simultaneously.

### 2. Installation Procedures

- Turn off power to the MultiTasker system and disconnect from AC power.
- Remove an unused slot cover (MT200-101) from the enclosure.
- Slide the MT104-102 into the enclosure in order to connect it to the bus. Make sure that the card fits into place and then secure the card by tightening the top and bottom retainer screws.
- Restore power to the MultiTasker system.
- The LED on the card panel will turn red indicating that the card is in full operation.
- Connect cables from the video sources to the input connectors of the MT104-102. Connect the output connector of the MT104-102 to the display device using a high-quality cable.
- Starting from the left, identify the slot number where the MT104-102 card is plugged into the enclosure and note that it is for RS-232 control.
- The MT104-102 is now operational.
- See the RS-232 Control commands in the next section to make the proper input to output connections.

### 3. Limited Warranty/Return policies

Please see the ALTINEX website at [www.altinex.com](http://www.altinex.com) for details on warranty and return policies.

#### 1.3 Cleaning

- Clean only the connector area with a dry cloth. Never use strong detergents or solvents, such as alcohol or thinner. Do not use a wet cloth or water to clean the card. Do not clean or touch any component or PCB.

#### 1.4 FCC Notice

- This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions found herein, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
- Any changes or modifications to the unit not expressly approved by ALTINEX, Inc. could void the user's authority to operate the equipment.

#### 4. Technical Specifications

Specifications are subject to change. See [www.altinex.com](http://www.altinex.com) for up-to-date information.

<b>Features/Description</b>		<b>MT104-102</b>
General		
Inputs		
External Video	15-pin HD F (6)	
Internal Video	10-pin IDC (1)	
Outputs		
Video	15-pin HD F (1)	
Compatibility		
Video Resolutions	VGA thru QXGA	
Signal Types	RGBHV & RGBS	

Table 1. MT104-102 General

<b>Mechanical</b>	<b>MT104-102</b>
Enclosure Slots Required	Two
Weight	1.0 lb (0.45 kg)
Connector Panel	Black
T° Operating	10°C-35°C
T° Storage	50°C
Humidity	90% non-condensing
MTBF (calc.)	40,000 hrs

Table 2. MT104-102 Mechanical

<b>Electrical</b>	<b>MT104-102</b>
Input Video Signals	
Analog	1.7 Vp-p max
Impedance	75 ohms
Type	Differential
Input Sync Signal	
Horizontal, Vertical	TTL (+/-)
Impedance	10 kohms
Output Video Signals	
Analog	1.7 Vp-p max.
Impedance	75 ohms
Output Sync Signals	
Horizontal, Vertical	TTL (+/-)
Impedance	22 ohms
Frequency Compatibility	
Horizontal	15-130 kHz
Vertical	25-180 Hz
Bandwidth	350 MHz @-3dB
Power Consumption (from enclosure)	
+6V	150 mA (0.9 W)
-6V	100 mA (0.6 W)
Total Power	1.5 W max.

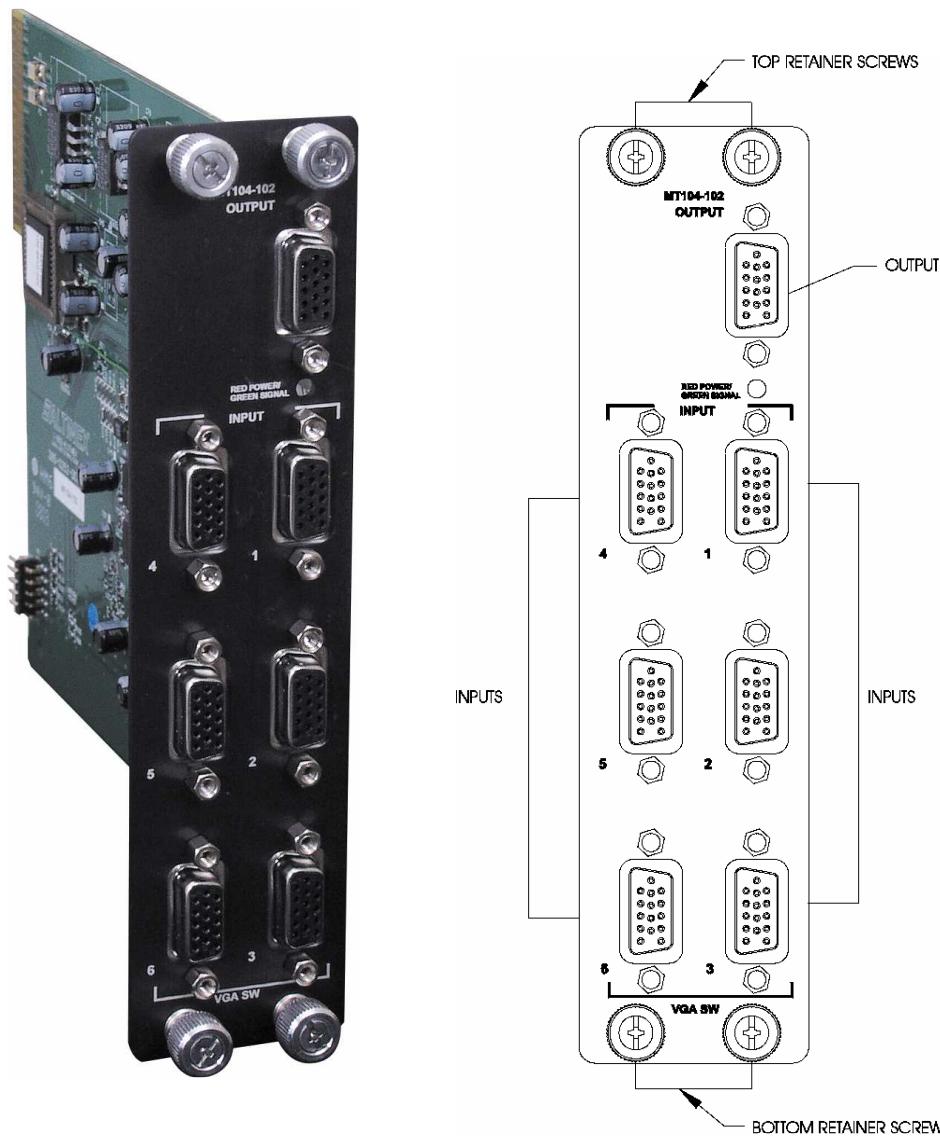
Table 3. MT104-102 Electrical

## 5. About Your MT104-102

The MT104-102 6-In, 1-Out MT VGA Switcher Card uses two slots in MultiTasker enclosures. This card enables multiple computer video sources to be connected and switched to a single scan-rate compatible display. Resolutions supported range from VGA to QXGA.

Inputs and outputs both use 15-pin HD female (VGA-type) connectors. If used together with 15-pin HD to 5 BNC adapter cables available from ALTINEX, the MT104-102 can pass RGBHV format computer video signals. Inputs are selected via easy-to-use ASCII commands from a control system or computer connected to the RS-232 port of the MultiTasker enclosure.

For convenience and flexibility, the MT104-102 employs Sync Delay, which briefly "blanks" the video channel signals while switching between sources avoiding visual "glitches." The MT104-102 is Plug & Play compatible. To expand the number of VGA inputs, the MT104-102 can be connected to an MT VGA SW Expansion card. For more information on expansion see the MT104-104 & MT103-106 product descriptions.



### 6. Application Diagrams

Diagram 1: Typical Setup

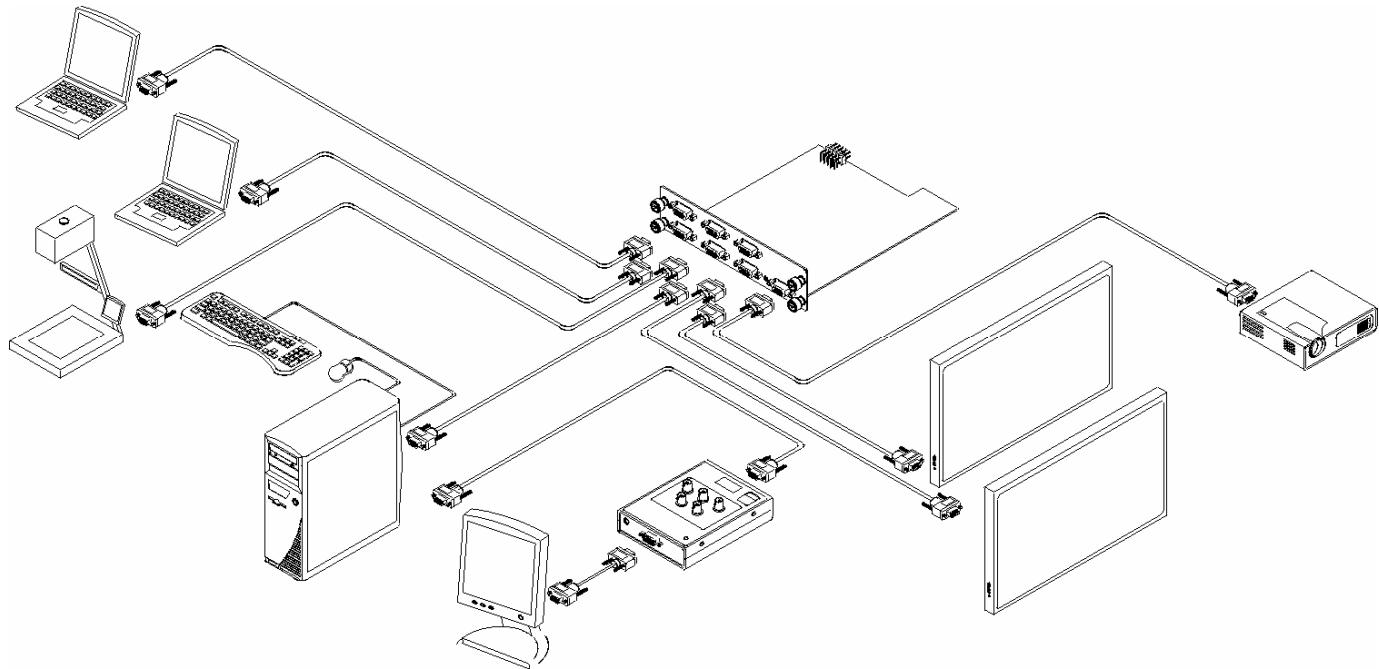
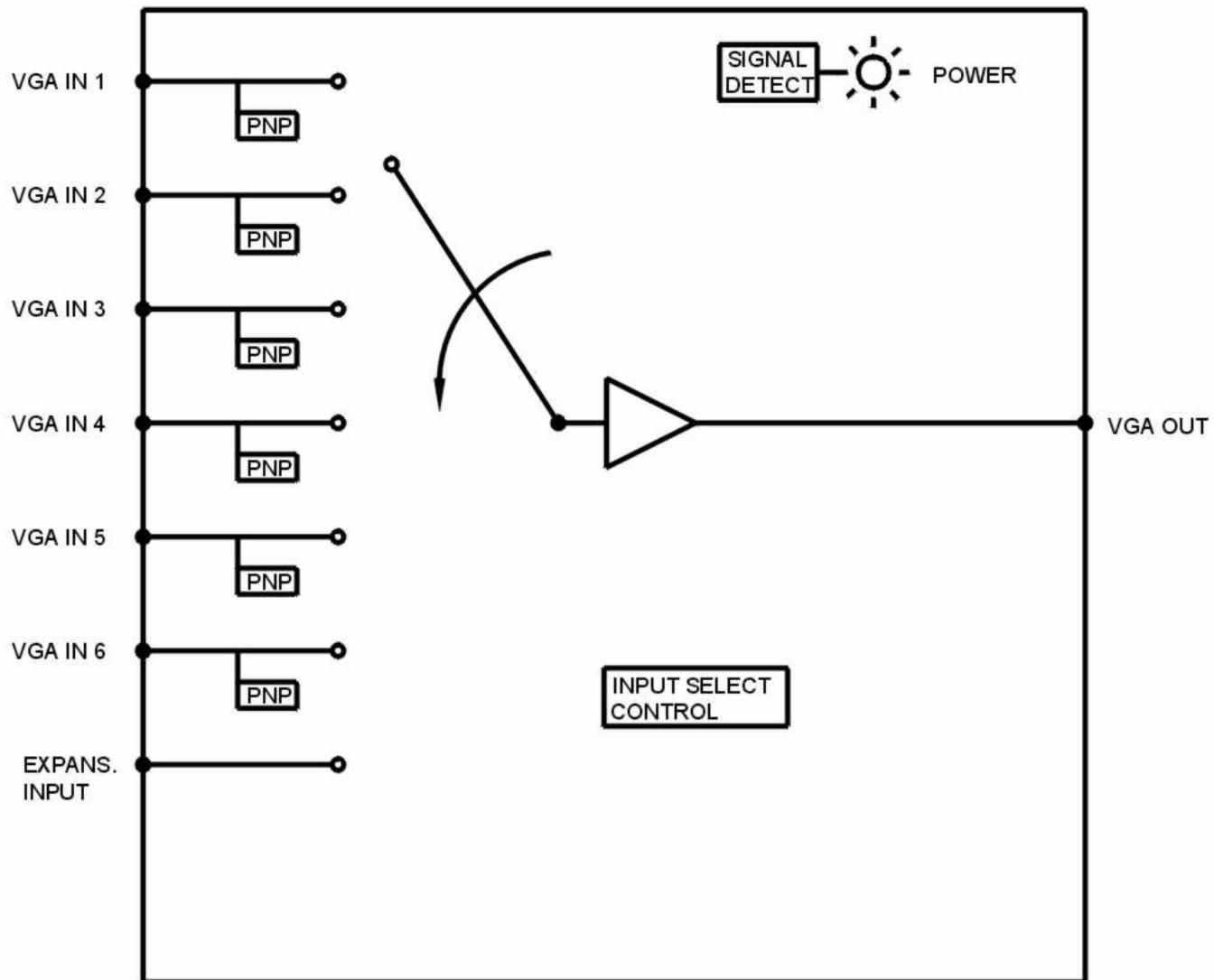


Diagram 2: Internal View

6 IN 1 OUT VGA SW + 350 MHZ + EXPANDABLE + SIG. DETECT + PNP



## 7. Operation

### 7.1 RS-232 Control

The MT104-102 has many advanced remote-control capabilities accessible through standard RS-232 communication using a computer, control system, or any device capable of RS-232 communication.

#### 7.1.1 RS-232 Interface

The control commands for the MT104-102 are in a simple ASCII character format.

1. Square brackets "[ ]" are part of the command.
2. Use uppercase letters for all commands.
3. Spaces are NOT legal characters.

The cards in a MultiTasker are capable of performing various functions, as well as providing feedback to the user or control system. Commands instruct a card to perform specific actions or request information from the card. Some commands do both simultaneously.

A command that instructs the card only to perform an action will generate feedback of "[ ]". The open bracket immediately followed by a closed bracket indicates the card received a valid command. If the command requested information from the card, the feedback generated by the card is the acknowledgement of having received a valid command. Invalid commands generate feedback that includes "ERR" plus an error code.

Example 1: [ERR001] Error number

Example 2: [ERRC04] Card error C4

Commands ending in "S" will be saved into memory. Commands not ending in "S" are executed, but not restored at reset or powered-up.

### 7.1.2 Conventions Used in this Manual

Card IDs:

In this manual, cards are referenced by their card ID; typically equivalent to the slot number:

C1, C2, C3, C4 ... C99

Group IDs:

Groups are referenced by their group ID:

G1, G2, G3 ... G8

Unit IDs:

Units are referenced by their unit ID:

U0, U1, U2 ... U20

Examples for each command in the following sections do not include the unit ID. Commands sent to a MultiTasker without a unit ID are executed by all MultiTaskers connected to the RS-232 bus. It is only necessary to include the unit ID when there is more than one MultiTasker connected to the bus and the command is intended for cards in that MultiTasker only.

[VERC3]: Executed by all MultiTaskers on the RS-232 bus.

[VERC3U1]: Executed by MultiTasker unit ID U1 only.

## 7.2 Description of Commands

Each command consists of three parts: Function, Card ID, and Unit ID.

[ Function , Card ID , Unit ID ]

Example: [VERC3U2]

VER	= Function
C3	= Card ID or Group ID
U2	= Unit ID (optional for Unit ID 0)

For Function, see a detailed explanation under each description.

The card ID is a unique identifier. It is equal to the enclosure slot number, or it may be an assigned value. As the slot number, the value can range from 1-4 up to 1-20 depending on the enclosure. If the value is assigned, the ID may be a maximum of 99. Card ID 0 (C0) is used for the controller and cannot be reassigned.

The group ID is a number representing a group of cards defined with the [WR] command. When using the group ID, all cards in the group perform the given instruction.

Changing the position of a card significantly affects the commands recorded on software definitions or third-party control systems.

Example:

[VERC3]:	For U0 or all MultiTaskers on the bus.
[VERC3Ui]:	For IDs other than U0 or all MultiTaskers.
[VERC3]:	Equivalent to [VERC3U0] for U0.

## Command Organization

The RS-232 commands in this section are organized into the following 5 categories:

- Basic Commands
- Feedback Control
- Card Control
- Card IDs
- Groups

See the Summary of Commands (Section 7.3) for one-line descriptions of each command.

---

Basic Commands

The basic commands provide general information about the card and are most useful during the initial stages of setting up and operating the card.

**1. [VER]**

This command displays the firmware version and model number for the MT104-102 card.

Command Format: [VERCn]

Cn = Card ID (n = slot # from 1 to max slots)

Example:

There is an MT104-102 card in slot 4. Send the command [VERC4] and card will return the following feedback:

[MT104-102 690-0158-007C04]

MT104-102 = the card model

690-0158-007 = the software version

C04 = card ID number

**2. [C]**

This command displays the status of the card.

Command Format: [Cn]

Cn = Card ID (n = slot # from 1 to max slots)

Example:

There is an MT104-102 in slot 4 with Input 2 selected and the output is enabled, ON. Send [C4] and receive feedback similar to following:

ON 2 C04

**3. [CnS]**

This command saves the current status of the card. These settings are restored after system reset or powered off, then back on.

Command Format: [CnS]

Cn = Card ID (n = # from 1 to max slots)

S = save configuration

Example:

Save the setup from [C] command example by sending [C4S]:

ON 2 C04 [SAVED]

**4. [...S] – Save**

This command will save the configuration command being sent in memory. Send [ON1C4S] to the engine. After reset or power-up, Input 1 of C4 is selected and the output is enabled.

**5. [CLR]**

This command resets the MT104-102 to the factory default; Input 1 selected, output enabled.

Command Format: [CLRCn]

Cn = Card ID (n = slot # from 1 to max slots)

Example:

Clear the MT104-102 card in slot 4 by sending [CLRC4].

**6. [TEST]**

This command performs a series of internal tests on the matrix engine memory.

Command Format: [TESTCn]

Cn = Card ID (n = slot # from 1 to max slots)

Upon completion, the system will display the results. This feedback will be similar to the following, otherwise failures will be indicated.

MEMORY IS GOOD

**7. [HELP]**

This command displays information available for the MultiTasker interface commands.

Command Format: [HELPcN]

Cn = Card ID (n = slot # from 1 to max slots)

Example:

In order to display the RS-232 commands available for the MT104-102 in slot 4, send the command [HELPc4]. The commands along with a brief description will be displayed.

---

Feedback Control

The next commands are a function of both the card and the front panel and allow flexibility over when and how card information is displayed.

**8. [FBD]**

This command turns feedback delay on or off. It is necessary when installing some newer cards in older systems. If the system does not receive all of the feedback from the card, the card may be communicating too fast. This command will slow down the card's communication rate.

Command Format: [FBDM]

m = Delay (0= no delay, 1= delay 100mS)

Example:

The command [HELPc4] is sent to the card in slot 4. Some of the HELP file is displayed on the screen, but most is missing. Send the command [FBD1] to slow down the rate at which the card sends feedback to the system.

**9. [?]**

This command displays general information about a MultiTasker and its installed cards.

Command Format: [?Ui]

Ui = Unit ID (i = from 0 to 20)

Example:

A MultiTasker with unit ID 0 has a front panel with model number MT101-110, and contains an MT104-102 in slot 4. Send the command [?] and receive feedback similar to the following:

[(MT101-110U0)(MT104-102C04)(MT105-108C06)(MT106-103C08)]

MT101-111U0 = Panel model number/unit ID

MT104-102C04 = MT104-102 is in slot 4

MT105-108C06 = MT105-108 is in slot 6

MT106-103C08 = MT106-103 is in slot 8

**10. [?C]**

This command displays general information about a card and its status.

Command Format: [?Cn]

Cn = Card ID (n = # from 1 to max slots)

Example:

The MT104-102 in slot 4 has Input 1 ON. Send [?C4] to display the feedback status.

[(MT104-102C04)(VR690-0158-007C04)(IN2C04)]

All status feedback is enclosed in brackets, "[ ]". Each data field within the status is enclosed in parentheses. The first two characters identify the status type. The last three characters are the card's ID.

**11. [STA1]**

This command enables automatic feedback from the front panel. The command affects any card with auto feedback capability, not just the MT104-102. The default at power on or reset is STA0, off. For more details, see the [?Cn] command definition.

Command Format: [STA1]

Feedback Prefix Definitions:

MT = Model Number

VR = Firmware Version

IN = Input Selected

Example:

Command = [ON2C4]

Feedback = [ ] (IN2C04)

IN = Input

2 = Input Number

**12. [STA0]**

This command disables automatic feedback from the card and front panel. The command affects any card with auto feedback capability, not just the MT104-102. The default at power-on or reset is STA0, OFF.

Command Format: [STA0]

**13. [...F]**

After processing a command, an OK or [ERR001] will be returned as feedback if "F" is included at the end of a command string.

Command = [ON2C2F]

Feedback = OK

---

**Card Control**

---

Card control commands allow the main card functions to be executed over the RS-232 bus, or from the MultiTasker front panel.

**14. [ON]**

This command selects an input and enables the output.

Command Format: [ONmCn]

m = Input number (m = # from 1 to 6 slots)

Cn = Card ID (n = # from 1 to max slots)

Example:

The command [ON2C4] connects the signal on Input 2 of C4 to the output and enables the output.

**15. [OFF]**

This command disables the output without changing the selected input.

Command Format: [OFFCn]

Cn = Card ID (n = # from 1 to max slots)

Example:

Send the command [OFFC4] to disable the output of C4.

**16. [...P]**

This command sets the path for the output, but it is not active until the switch command, [SW], is executed. Commands ending in "P" are not executed immediately. The path for outputs on multiple cards or the same card can be preloaded.

Example:

There is an MT104-102 in slot 4; Input 1 currently selected. The PATH command is used to preload Input 5 as follows:

[ON5C4P]

The status of the card, [C4], remains as follows until the switch command is received:

ON 1 C04

Send the command [SW] and then check the status of C4 as follows:

[SW] [C4]

The new feedback is:

ON 5 C04

**17. [SW]**

This command immediately connects inputs and outputs previously set with the PATH command. The command switches all paths set on this card and all other cards in the enclosure.

**18. [SIG]**

This command checks for the presence of a video signal on the output of the card and returns "1" if a signal is present and "0" if there is no signal.

Command Format: [SIGCn]

Cn = Card ID (n = # from 1 to max slots)

Example:

There is a video input signal on Input 1 of C4, Input 1 is selected, and the output is enabled. Send the command [SIGC4] and receive the following feedback:

1

If the output is disable, the card returns "0."

**ID Commands**

The default card ID is the same as the card slot number. The next several commands allow the user to change the card ID to a value other than the slot number. Once the ID is changed, moving the card to another slot will not change the card ID. If a card in slot 4 is set to ID 1, then moved to slot 10, its ID will remain 1. The [RSI] command forces each installed card to take its slot number as its ID number, regardless of the slot in which it is installed.

Some cards require more than one slot in the MultiTasker system. As an example, some matrix switcher cards require 4 slots. If 5 of these cards are installed, they would be numbered C4, C8, C12, C16, and C20. Changing the ID allows the user to define the cards as C1, C2, C3, C4, and C5.

Another use for changing the card ID is to be able to use multiple systems without having to set each unit to a different unit ID. All systems may be left as unit ID 0 for ease of programming. The cards in the first unit may be numbered 1-10 and in the second unit 11-20.

**19. [RSI]**

This command resets the card IDs in the system. After sending this command, each card ID in the system will match the slot number of the card. If the card is moved to another slot, its ID number will be the new slot number.

Command Format: [RSI]

Example:

Send the command [RSI] to the system with Unit ID 0. The card in slot 1 will have ID 1, the card in slot 2 will have ID 2, and so on. If the card in slot 1 is then moved to slot 4, the card ID will then be 4.

**20. [SIDn]**

This command sets all the cards installed in the MultiTasker system to the same card ID. After sending this command, all cards will be addressed with the same ID. Use caution when sending this command to a system with multiple board types.

Command Format: [SIDn]

n = Card ID (n = # from 1 to 99)

Example:

Send the command [SID1] to the system. All the cards in the system now have ID 1. Any commands that are sent to card ID 1 will be received and executed by each card.

**21. [SIDnCi]**

This command sets the card ID of a single card to a number from 1 to 99.

Command Format: [SIDnCi]

n = Card ID (n = # from 1 to 99)

Ci = Slot Number (i = # from 1 to max slots)

Example:

Send the command [SID50C10] to set the ID of the card in slot 10 to an ID of 50.

**22. [SID+]**

This command sets the card ID of all the cards in a system to their slot number plus the offset value.

Command Format: [SID+n]

n = Offset amount (n = # from 0 to 99)

The maximum card ID is 99, so subtract the highest slot number from 99 to find the maximum offset. For example, in an 8-slot enclosure, the maximum offset would be 91. The slot number (8) plus the offset (91) equals 99.

Example:

There are two 20-slot enclosures to be connected together during normal operation. The first unit will use the default IDs where the card ID is equal to the slot number. The second unit will have the same unit ID, but each card ID will be offset by 20.

Connect the computer to the second unit only and send the command [SID+20] to set the ID of all the cards in the second enclosure to their slot number plus 20. Reconnect both units to the computer.

The cards in the first unit will be referenced as card IDs 1-20 and the cards in the second unit will be referenced by card IDs 21-40.

**23. [RSN]**

This command displays the slot number of a card with a specified ID number. If more than one card has the same ID, each slot number will be displayed.

Command Format: [RSNCi]

Ci = Card ID (i = # from 1 to 99)

Example:

The card in slot 4 takes up four slots in the enclosure. Its ID was set to 1 since it is the first card installed in the system, reading from left to right. Send the command [RSNC1] to find the slot number of this card. The system responds with the following feedback:

[4]

---

Group Commands

---

Group commands allow several cards with the same functions to be controlled simultaneously with a single command. Up to 8 groups (G1-G8) may be defined. These commands apply to all cards, not only the MT104-102.

**24. [WR]**

This command adds cards to a group. In MultiTasker systems with audio and video cards, the groups are typically as follows:

Group 1 = Video Cards

Group 2 = Audio Cards

Group 3 = Video and Audio Cards

Command Format: [WRCn1Cn2...Gk]

Cn = Card ID (n = slot # from 1 to max slots)

Gk = Group ID (k = # from 1-8)

Example:

Add C2, C4, and C6 to G5 by sending the command [WRC2C4C6G5]. After executing this command, G5 will consist of C2, C4, and C6.

Now add C8 to G5 by sending [WRC8G5]. C8 is added to G5, and G5 is not overwritten. View the contents of G5 by sending [RDG5] and receiving the following feedback:

[G5=C2C4C6C8]

**25. [RMC]**

This command removes one or more cards from a group.

Command Format: [RMCn1Cn2...Gk]

Cn = Card ID (n = # from 1 to max slots)

Gk = Group ID (k = # from 1-8)

Example:

G5 consists of C2, C4, C6, and C8. Remove C6 and C8 by sending [RMC6C8G5]. View the contents of G5 by sending [RDG5] and receiving the following feedback:

[G5=C2C4]

**26. [RMG]**

This command deletes one or all groups.

Command Format: [RMGk]

Gk = Group ID (k = # from 1-8, \* for all)

Example:

Remove all cards from G5 by sending [RMG5]. The system will return the following feedback:

[G5=0]

Example 2:

Remove all cards from all groups, effectively deleting all groups, by sending [RMG\*]. The system will return the following feedback:

G1-G8: EMPTY

**27. [RD]**

This command reads and then displays the members in a group.

Command Format: [RDGk]

Gk = Group ID (k = # from 1-8)

Example:

C2, C4, and C6 make up G5. Read the member data for G5 by sending the command [RDG5]. The system will return feedback as follows:

[G5=C2C4C6]

The feedback shows G5 and then the cards that make up G5. In this case, G5 includes C2, C4, and C6.

### 7.3 Summary of Commands

#### Basic Commands

- |           |                            |
|-----------|----------------------------|
| 1) [VER]  | Display firmware version   |
| 2) [C]    | Display card status        |
| 3) [CnS]  | Save card settings         |
| 4) [...S] | Save command being sent    |
| 5) [CLR]  | Reset to defaults          |
| 6) [TEST] | Test internal memory ICs   |
| 7) [HELP] | Display available commands |

#### Feedback Commands

- |            |                          |
|------------|--------------------------|
| 8) [FBD]   | Feedback delay on/off    |
| 9) [?]     | Display system cards     |
| 10) [?C]   | Display card information |
| 11) [STA1] | Auto-feedback on         |
| 12) [STA0] | Auto-feedback off        |
| 13) [...F] | Display "OK" feedback    |

#### Card Control Commands

- |            |                             |
|------------|-----------------------------|
| 14) [ON]   | Enable one or more outputs  |
| 15) [OFF]  | Disable one or more outputs |
| 16) [...P] | Sets the path, [SW] preload |
| 17) [SW]   | Switch preloaded outputs    |
| 18) [SIG]  | Check for signal on output  |

#### ID Commands

- |              |                               |
|--------------|-------------------------------|
| 19) [RSI]    | Reset Card IDs to defaults    |
| 20) [SIDn]   | Set all Card IDs              |
| 21) [SIDnCi] | Set one Card ID               |
| 22) [SID+]   | Set all Card IDs to an offset |
| 23) [RSN]    | Display card slot number      |

#### Group Commands

- |           |                           |
|-----------|---------------------------|
| 24) [WR]  | Add card(s) to a group    |
| 25) [RMC] | Remove card(s) from group |
| 26) [RMG] | Delete group              |
| 27) [RD]  | Display group members     |

### 8. Troubleshooting Guide

We have carefully tested and have found no problems in the supplied MT104-102; however, we would like to offer suggestions for the following:

#### 8.1 LED is Not Lit

Cause 1: Card cage is not plugged in.

*Solution:* Plug card cage in. If the LED lights, the problem is solved. If the LED is still not lit, see Cause 2.

Cause 2: Card is not plugged in all the way.

*Solution:* Push the card in all the way. If the LED is still not lit, see Cause 3.

Cause 3: Card cage slot has a problem.

*Solution 1:* Test the card in other slots of the card cage. If the slot was damaged, the card may work in other slots. If other slots work and the LED lights, the problem is the card cage slot. The card cage may require service. Call ALTINEX at (714) 990-2300. If the other slots do not work and the LED is still not lit, see Solution 2.

*Solution 2:* Take any other known good card with an LED and verify that the slot used is good by seeing if the other card's LED lights in that slot. If it lights, then the original card may be the source of the problem. Call ALTINEX at (714) 990-2300.

#### 8.2 No Display

Cause 1: The source has a problem.

*Solution:* Check the source and make sure that there is a signal present and all source connections are correct. If the source is working and there is still no display, see Cause 2.

Cause 2: The card input is not selected.

*Solution:* Select the card input. See RS-232 accessible commands in Section 7. If no display is present, see Cause 3.

Cause 3: Cable connections to the destination are incorrect.

*Solution:* Make sure that cables are connected properly. Also, make sure that the continuity and wiring are good. If there is still no display present, see Cause 4.

Cause 4: The display has a problem.

*Solution:* Make sure that the display is powered. If there is still no display, call ALTINEX at (714) 990-2300.